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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/655,295	09/05/2000	David R. Cheriton	102.1061.01	8141

7590 12/29/2004

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EXAMINER	
RYMAN, DANIEL J	

ART UNIT	PAPER NUMBER
2665	

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/655,295	CHERITON, DAVID R.	
	Examiner	Art Unit	
	Daniel J. Ryman	2665	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1 November 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16,18-26,28-30 and 32-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16,18-26,28-30 and 32-39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-26 have been considered but are moot in view of the new ground(s) of rejection.

Specification

2. Examiner requests that Applicant update the application information seen on page 6, lines 3-19 to reflect any changes in the status of these applications.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-7, 16, 18-20, 28-30, 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Duret et al. (USPN 6,704,313) in view of Varghese et al. (USPN 6,011,795).

5. Regarding claim 1, Duret discloses an apparatus for routing or switching data packets, including a router (col. 3, line 66-col. 4, line 9); and an expanded M-trie data structure (trie memory table) (col. 3, line 66-col. 4, line 9), said data structure having a set of nodes (cells), including a root node (gate cell), inferior nodes (elementary cell) and terminal nodes (final status cell) (col. 1, line 12-col. 2, line 16 and col. 7, line 25-col. 8, line 9), wherein each node includes an address (address of cell) and an opcode (command or code) (col. 3, lines 6-34, esp. col. 3, lines 26-34, and col. 7, line 26-col. 8, line 9).

Duret does not expressly disclose that the trie data structure is organized as a multi-level tree. Varghese teaches as prior art that trie data structures are defined as multi-level trees (Figs. 5 and 7 and col. 5, line 12-30) where each tree will have multiple levels (Fig. 7: level 1, root node; level 2, node 1; etc.). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to organize the trie data structure as a multi-level tree since a trie data structure is defined as a multi-level tree.

6. Regarding claim 2, referring to claim 1, Duret in view of Varghese discloses that said data structure facilitates a lookup based on data included in a data packet (Duret: col. 4, lines 4-51).

7. Regarding claim 3, referring to claim 1, Duret in view of Varghese discloses that said data structure facilitates a lookup of data included in a packet header (Duret: col. 4, lines 4-51).

8. Regarding claim 4, referring to claim 1, Duret in view of Varghese discloses as part of a primary embodiment that the packet can include multiple types of packets including IP packets (Duret: col. 4, lines 42-46). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the data structure facilitate a lookup of data included in an Internet Protocol packet header since IP packets are disclosed as a type of packet on which the data structure operates.

9. Regarding claim 5, referring to claim 1, Duret in view of Varghese discloses that said opcode describes an operation to be performed based upon data included in a packet header so as to facilitate lookup of said packet header (Duret: col. 3, lines 25-34).

10. Regarding claim 6, referring to claim 1, Duret in view of Varghese discloses that said address includes the address (pointer) of a node (cell) in said expanded M-trie data structure that is to be traversed (Duret: col. 6, lines 9-14 and col. 6, lines 28-36).

11. Regarding claim 7, referring to claim 1, Duret in view of Varghese discloses as part of an embodiment that said expanded M-trie data structure includes a set of access control parameters (ToS) (Duret: col. 5, lines 17-31). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the expanded M-trie data structure include a set of access control parameters since the access control parameter TOS is disclosed being part of the trie data structure.

12. Regarding claim 16, Duret discloses a method for routing or switching data packets, including steps of receiving a data packet at an input interface on a router or switch (col. 3, lines 6-34 and col. 3, line 66-col. 4, line 9); looking up information in the header of said data packet in an expanded M-trie data structure (col. 3, lines 6-34 and col. 3, line 66-col. 4, line 9); wherein said expanded M-trie data structure includes a set of nodes (cells), including a root node (gate cell), inferior nodes (elementary cell) and terminal nodes (final status cell) (col. 1, line 12-col. 2, line 16 and col. 7, line 25-col. 8, line 9), wherein each node includes an address (address of cell) and an opcode (command or code) (col. 3, lines 6-34, esp. col. 3, lines 26-34, and col. 7, line 26-col. 8, line 9); terminating said lookup (col. 3, lines 6-34 and col. 3, line 66-col. 4, line 9); and routing said data packet at one or more output interfaces on said router or said switch (col. 3, lines 6-34 and col. 3, line 66-col. 4, line 9).

Duret does not expressly disclose that the trie data structure is organized as a multi-level tree. Varghese teaches as prior art that trie data structures are defined as multi-level trees (Figs. 5

and 7 and col. 5, line 12-30) where each tree will have multiple levels (Fig. 7: level 1, root node; level 2, node 1; etc.). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to organize the trie data structure as a multi-level tree since a trie data structure is defined as a multi-level tree.

13. Regarding claim 18, referring to claim 16, Duret in view of Varghese discloses that said opcode describes an operation to be performed that is based upon data included in a packet header, so as to facilitate a lookup of said packet header (Duret: col. 3, lines 25-34).

14. Regarding claim 19, referring to claim 16, Duret in view of Varghese discloses that said address includes the address (pointer) of a node (cell) in said expanded M-trie data structure that is to be traversed (Duret: col. 6, lines 9-14 and col. 6, lines 28-36).

15. Regarding claim 20, referring to claim 16, Duret in view of Varghese discloses as part of an embodiment that said expanded M-trie data structure includes a set of access control parameters (ToS) (Duret: col. 5, lines 17-31). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the expanded M-trie data structure include a set of access control parameters since the access control parameter TOS is disclosed being part of the trie data structure.

16. Regarding claims 28-30, Duret discloses an apparatus for routing or switching data packets (col. 4, lines 4-8), comprising a device that performs a method comprising where the method is implemented using a memory storing a program (col. 4, lines 4-8): storing in memory an M-trie data structure having a set of nodes (cells), including a root node (gate cell), inferior nodes (elementary cell), and terminal nodes (final status cell) (col. 1, line 12-col. 2, line 16 and col. 7, line 25-col. 8, line 9), wherein each node includes an address (address of cell) and an

opcode (command or code) (col. 3, lines 6-34, esp. col. 3, lines 26-34, and col. 7, line 26-col. 8, line 9); receiving a data packet at an input interface on a router or switch (col. 3, lines 6-34 and col. 3, line 66-col. 4, line 9), wherein the data packet includes information in at least a header with at least a field (portion of the header) that is used by said M-trie data structure to indicate an action for the router to perform to select a leaf (final status cell) associated with the M-trie data structure (col. 3, lines 6-34 and col. 3, line 66-col. 4, line 9); looking up the information, wherein the looking up includes performing the action (col. 3, lines 6-34 and col. 3, line 66-col. 4, line 9); and routing said data packet at one or more output interfaces on said router or said switch (col. 3, lines 6-34 and col. 3, line 66-col. 4, line 9).

Duret does not expressly disclose that the trie data structure is organized as a multi-level tree. Varghese teaches as prior art that trie data structures are defined as multi-level trees (Figs. 5 and 7 and col. 5, line 12-30) where each tree will have multiple levels (Fig. 7: level 1, root node; level 2, node 1; etc.). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to organize the trie data structure as a multi-level tree since a trie data structure is defined as a multi-level tree.

17. Regarding claim 32, referring to claim 30, Duret in view of Varghese discloses that said address includes an address (pointer) of a node (cell) in said M-trie data structure that is to be traversed (Duret: col. 6, lines 9-14 and col. 6, lines 28-36).

18. Regarding claim 33, referring to claim 30, Duret in view of Varghese discloses as part of an embodiment that said expanded M-trie data structure includes a set of access control parameters (ToS) (Duret: col. 5, lines 17-31). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the expanded M-trie data structure

include a set of access control parameters since the access control parameter TOS is disclosed being part of the trie data structure.

19. Claims 8, 9, 21, 22, 34, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Duret et al. (USPN 6,704,313) in view of Varghese et al. (USPN 6,011,795) as applied to claims 1, 16, and 30 above, and further in view of Chiu et al. (USPN 6,385,170).

20. Regarding claims 8, 21, and 34, referring to claims 1, 16, and 30, Duret in view of Varghese does not expressly disclose that said expanded M-trie data structure includes a set of Quality of Service (QoS) parameters; however, Duret in view of Varghese does disclose that the trie data structure contains programmable instructions (opcode) for defining which portions of the header should be examined in a router (Duret: col. 3, lines 26-34). Duret in view of Varghese also discloses that the router can operate on the ToS field of an IP packet (Duret: col. 5, lines 17-31). Chiu teaches as prior art, in a routing system, that "In order to support increasing demands for real-time and multimedia applications as well as mission critical applications, Internet Protocol (IP) need to support quality of service (QoS)" (col. 1, lines 15-19). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the expanded M-trie data structure include a set of Quality of Service (QoS) parameters in order to support increasing demands for real-time and multimedia applications as well as mission critical applications.

21. Regarding claims 9, 22, and 35, referring to claims 1, 16, and 30, Duret in view of Varghese does not expressly disclose that said expanded M-trie data structure includes a set of Class of Service (CoS) parameters; however, Duret in view of Varghese does disclose that the trie data structure contains programmable instructions (opcode) for defining which portions of

the header should be examined in a router (Duret: col. 3, lines 26-34). Duret in view of Varghese also discloses that the router can operate on the ToS field of an IP packet (Duret: col. 5, lines 17-31). Chiu teaches as prior art, in a routing system, that "In order to support increasing demands for real-time and multimedia applications as well as mission critical applications, Internet Protocol (IP) need to support quality of service (QoS)" (col. 1, lines 15-19). Chiu also discloses that "In order to avoid the scalability problem with flow-based QoS, class-based QoS, which is also referred to as Class of Service (CoS), is proposed to provide differentiated service for each class" (col. 1, lines 52-55). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the expanded M-trie data structure include a set of Class of Service (CoS) parameters in order to support increasing demands for real-time and multimedia applications as well as mission critical applications while avoiding the scalability problems of flow-based QoS.

22. Claims 10-13, 15, 23, 24, 26, 36, 37, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Duret et al. (USPN 6,704,313) in view of Varghese et al. (USPN 6,011,795) as applied to claims 1, 16, and 30 above, and further in view of Onishi et al. (USPN 5,434,863).

23. Regarding claims 10, 23, and 36, referring to claims 1, 16, and 30, Duret in view of Varghese discloses in embodiments of the invention that said nodes include opcodes for demultiplexing (Duret: col. 3, lines 10-34), where the instructions in the opcode have the trie follow different paths depending on the contents of the header, and opcodes for matching (Duret: col. 3, lines 10-34; col. 4, lines 33-38; col. 5, lines 18-31; and col. 7, lines 15-25), where the opcodes specify headers in the packet which are used to run certain checks and apply actions to the packet header.

Duret in view of Varghese does not expressly disclose that the nodes include opcodes for hashing; however, Duret in view of Varghese does disclose that the trie data structure contains programmable instructions (opcode) for arbitrarily defining which portions of the header should be examined in a router (Duret: col. 3, lines 26-34). Duret in view of Varghese also discloses that the trie enters into different branches in the trie structure depending on the portion of the header examined (Duret: col. 3, lines 10-34 and col. 5, line 41-col. 6, line 17). Ohishi teaches, in a routing system, implementing a routing (forwarding) table using a hash function, where the hash function projects a certain amount of data onto a smaller amount of data and then uses pointers to find routing information for a packet, in order to perform high speed retrieval (col. 8, lines 14-32). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to the nodes include opcodes for hashing in order to perform high-speed retrieval.

24. Regarding claim 11, referring to claim 10, Duret in view of Varghese in further view of Ohishi discloses that said opcodes for demultiplexing include instructions to demultiplex into branches of said expanded M-trie data structure based on contents of one or more bytes included in a data packet (Duret: col. 3, lines 10-34), where the instructions in the opcode have the trie follow different paths depending on the contents of the header.

25. Regarding claims 12, 24, and 37, referring to claims 10, 23, and 36, Duret in view of Varghese in further view of Ohishi discloses that said opcodes for demultiplexing include instructions to demultiplex into branches of said expanded M-trie data structure based on contents of one or more bytes included in a packet header that is being read (Duret: col. 3, lines 10-34), where the instructions in the opcode have the trie follow different paths depending on the contents of the header.

26. Regarding claim 13, referring to claim 10, Duret in view of Varghese in further view of Ohishi discloses that said opcodes for demultiplexing include instructions to demultiplex into branches of said expanded M-trie data structure based on contents of one or more bytes included in an Internet Protocol packet header that is being read (Duret: col. 3, lines 10-34 and col. 4, lines 41-46), where the instructions in the opcode have the trie follow different paths depending on the contents of the header.

27. Regarding claims 15, 26, and 39, referring to claims 10, 23, and 36, Duret in view of Varghese in further view of Ohishi discloses that said opcodes for hashing include instructions to hash into different branches of the expanded M-trie data structure based on contents of a given set of byte in said packet header (Duret: col. 3, lines 10-34 and Ohishi: col. 8, lines 14-32).

28. Claims 14, 25, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Duret et al. (USPN 6,704,313) in view of Varghese et al. (USPN 6,011,795) in further view of Onishi et al. (USPN 5,434,863) as applied to claims 10, 23, and 36 above, and further in view of Chiu et al. (USPN 6,385,170).

29. Regarding claims 14, 25, and 38, referring to claims 10, 23, and 36, Duret in view of Varghese in further view of Ohishi discloses that said opcodes for matching include instructions to compare contents of a byte in the header to given node data (col. 3, lines 10-34; col. 4, lines 33-38; col. 5, lines 18-31; and col. 7, lines 15-25). Duret in view of Varghese in further view of Ohishi does not expressly disclose that that said opcodes for matching include instructions to compare contents of a byte in the flow label to given node data. Chiu teaches as prior art, in a routing system, that "An IP flow is defined as a set of packets matching a particular profile" where IP packets are handled according to flow (col. 1, lines 15-41). Therefore, it would have

been obvious to one of ordinary skill in the art at the time of the invention to have the opcodes for matching include instructions to compare contents of a byte in the header to given node data in order to allow an IP packet to be handled according to its flow.

Conclusion

30. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Venkatachary et al. (USPN 6,212,184) see col. 14, line 29-col. 15, line 21 which pertains to the implementation of trees using trie data structure.

31. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel J. Ryman whose telephone number is (571)272-3152. The examiner can normally be reached on Mon.-Fri. 7:00-4:30 with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on (571)272-3155. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Daniel J. Ryman
Examiner
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